

## **DECLARATION UNDER 37 C.F.R. § 1.132**

I, Raymond Neff, hereby state that:

1. I am a citizen of the United States.

2. I am currently employed as a Senior Research Chemist for BASF Corporation of Wyandotte, MI. I have worked in the field of polyurethane chemistry for 15 years and I have been employed by BASF Corporation since 1997 and I am a person highly skilled in the art of polyurethane formulation. I earned a Bachelor of Science degree in Chemical Engineering from the University of Illinois in 1990, and a Ph.D in Chemical Engineering from the University of Minnesota in 1995. My Ph.D. thesis was titled "Reactive Processing of Flexible Polyurethane Foam," and was advised by Professor Christopher Macosko, a renowned scientist in the field of polyurethanes. I have co-authored 6 peer-reviewed journal articles and 1 textbook chapter mostly in this field. In addition, I have made 6 presentations at the Society of Plastics Industry, API, and Polyurethane Foam Association polyurethane conferences, receiving one best paper award. Currently, I am serving on the Editorial Review Board for the Journal of Cellular Plastics, which publishes a substantial portion of its articles on the subject of polyurethanes.

3. I am a co-inventor of the following related co-pending applications:

(1) Applicant: Neff et al.  
Serial No.: 10/606,825  
Filed: June 26, 2003  
Atty. No: 12148  
Title: Viscoelastic Polyurethane Foam  
Art Unit: 1711  
Examiner: Cooney, John M.

(2) Applicant: Apichatachutapan et al.  
Serial No.: 10/607,555  
Filed: June 26, 2003  
Atty. No: 12164  
Title: Viscoelastic Polyurethane Foam  
Art Unit: 1711  
Examiner: Cooney, John M.

(3) Applicant: Neff et al.  
Serial No.: 10/916,241  
Filed: August 11, 2004  
Atty. No: 12252  
Title: Viscoelastic Polyurethane Foam  
Art Unit: 1711  
Examiner: Cooney, John M.

4. The subject Declaration sets forth a series of experiments and data conducted by the Declarant with regard to the above applications (1), (2), (3), to the Examples disclosed in the above applications (1), (2), (3), and to the cited prior art. The most significant results of these experiments are summarized immediately below. The results are set forth in greater detail in Paragraphs 11, 16, and 17.

	Chain Extender, pbw	T <sub>g</sub> (°C)
(1) Examples 7-12	7.5 - 30	29.1 - 50
(2) Examples 16-18	7.5 - 30	5 - 44
(3) Example 20	9	28.8
Hager et al.	2	<0
Lutter et al.	6	52

5. My invention involves developing formulations that include a chain extender as a component to adjust a glass transition temperature, or temperature sensitivity, of the viscoelastic polyurethane foam. My goal was to adjust the glass transition temperature without having to

significantly adjust or modify other major components of the formulations, i.e., isocyanate components and isocyanate-reactive components, to coincide with a use temperature, such as room temperature. Viscoelastic polyurethane foams have unique slow recovery characteristics and properties as a result of having hard segments dissolved in a soft segment phase, and the viscoelasticity is maximized when the resulting soft segment phase undergoes vitrification. This occurs when the glass transition temperature approximately coincides with ambient temperature. The subject invention achieves this goal because the presence of the chain extender manipulates the dissolved hard segments within the viscoelastic polyurethane foam, and therefore the glass transition temperature.

6. The subject invention allows for standard isocyanate components and isocyanate-reactive components comprising a flexible polyol and an EO-rich polyol to be used to form viscoelastic polyurethane foams having varying use temperatures and different temperature sensitivities by adjusting the amount of chain extender present therein. The subject invention has surprisingly determined that these unique results are obtained when the chain extender is used in amount of from 7 to 30 parts by weight based on 100 parts by weight of the viscoelastic polyurethane foam. While lower amounts of chain extenders are known, the resultant effects on the glass transition temperature when used in higher amounts was previously unexpected.

7. When a user comes into contact with the viscoelastic polyurethane foam, body heat from the user warms a portion of the viscoelastic polyurethane foam, thus softening it. The result is that the viscoelastic polyurethane foam molds to the shape of the body part in contact with the viscoelastic polyurethane foam creating a more uniform pressure distribution, which increases

comfort. In addition, the remainder of the viscoelastic polyurethane foam adjacent the warm, soft material remains relatively hard, providing support for the user. Thus, the temperature sensitivity increases the effective support factor of the viscoelastic polyurethane foam.

8. Prior to the subject invention, those of ordinary skill in the art manipulated the glass transition temperature of viscoelastic polyurethane foams by modifying or supplementing either one of the isocyanate component or the isocyanate-reactive component. Primarily, the isocyanate-reactive component was modified to achieve a specific glass transition temperature of the viscoelastic polyurethane foam. In other words, depending upon the particular uses of the viscoelastic polyurethane foam, a specific polyol component was formulated for that use. If other uses were desired that would occur at different use temperatures, then different polyol components were formulated.

9. The glass transition temperature of the viscoelastic polyurethane foam becomes significant when the articles formed from the viscoelastic polyurethane foam come into contact with a user. It is well known that viscoelastic polyurethane foams may be used as sound absorbing materials because of the unique cell structures of the viscoelastic polyurethane foam. However, when used as sound absorbing materials, the glass transition temperature is less relevant because a user does not come into contact with the article and therefore the variation of hardness with position does not result. Also, the viscoelastic polyurethane foam will act as a sound absorbing material at various temperatures.

10. It is also well known to include chain extenders in other polyurethane foams, such as

rigid and flexible polyurethane foams, polyurethane elastomers, and the like. However, none of these polyurethane foams have the unique combination of density and cell structures of viscoelastic polyurethane foams and these foams do not undergo the unique hardness variation when contacted by the user. Thus, viscoelastic properties are unique to viscoelastic polyurethane foams.

11. Additional experiments were performed by the Declarant, and in comparison with the Examples previously set forth in the above pending patent applications, to determine the effect of the presence of the chain extender. Specifically, the experiments focused on different isocyanate-reactive components and reacting the isocyanate-reactive component and the isocyanate component at different isocyanate indices.

In a first set of experiments, the amount of the chain extender and isocyanate index were varied. The base formulation for the viscoelastic polyurethane foam was as follows:

<b>Component</b>	<b>Parts By Weight</b>
Pluracol <sup>®</sup> 593 (a functionality of 2.96, a weight-average molecular weight of 3606, hydroxyl number of 460, and 75% EO-25% PO heteric)	90
Pluracol <sup>®</sup> 220 ( a functionality of 3, a weight-average molecular weight of 6000, hydroxyl number of 25, and 5% EO-95% PO heteric)	10
Pluracol <sup>®</sup> 355 (a functionality of 3.96, a weight-average molecular weight of 491, hydroxyl number of 453, and 10% EO-77.9% PO)	12
Catalyst 1 (Niax <sup>®</sup> A-1)	0.25
Catalyst 2 (DABCO <sup>®</sup> 33LV)	0.1
Stabilizer (Tegostab <sup>®</sup> B-8418)	3
Monol (benzyl alcohol)	8
Water	1.43
Isocyanate No. 233/Lupranate <sup>®</sup> MI/Lupranate <sup>®</sup> M20S (48.7/31.6/19.7)	

Table 1

The isocyanate-reactive component included a blend of a flexible polyol (Pluracol<sup>®</sup> 220) and a EO-rich polyol (Pluracol<sup>®</sup> 593) and the isocyanate-reactive component also included a cross-linker (Pluracol<sup>®</sup> 355), all of which are commercially available from BASF Corporation. In the first set of experiments, the EO-rich polyol is present in a major amount, i.e., 90 parts by weight. The chain extender utilized with the first set of experiments is 1,4-butanediol.

The foams were prepared in hand-mixes using standard hand-mix techniques. In the hand mixtures, all components, except isocyanate, were added into a 64-oz. paper cup and pre-blended for 48 seconds using a 3-inch diameter circular mix blade rotating at 2200 rpm. The isocyanate component was then added and mixed for 8 seconds. The mixture was then poured into a 5-gallon bucket and allowed to cure for at least 30 minutes at room temperature. The foams were then placed into an oven set at 121 °C for 16 hours.

A dynamic mechanical thermal analysis (DMTA) was measured in accordance with D4065 using a Rheometrics RSA II. With reference to Examples 1-8, which were disclosed in the pending patent application (1), the DMTA was determined using disk-shaped samples  $\frac{3}{4}$  inch wide by  $\frac{1}{2}$  inch thick that were die cut for the measurements and at a strain of 0.5%, frequency 1 Hz and heating rate 5 °C/min were used. The DMTA provides the glass transition temperature (T<sub>g</sub>) and peak tan delta for each of the foams.

New foam samples were prepared and tested for Examples 9-12, since the pending patent application (1) did not have examples with the chain extender present in an amount of 15 and 30 parts by weight. The DMTA was determined for the Examples 9-12 using new equipment and using disk-shaped samples 1 inch wide by  $\frac{1}{2}$  inch thick that were die cut for the measurements. The new equipment performed the DMTA tests at a strain of 0.02%, as opposed to 0.5% and at the same frequency Hz and heating rate. It is expected that the lower strain used for these examples reduces the glass transition temperature as compared to the Examples 1-8 from the pending patent application (1). As such, Examples 1-2 and 5-8 were also prepared and retested using the new machine and the different strain and the new results are set forth in Table 2 below.

Examples 1-12 were prepared by varying the amount of chain extender at two different isocyanate indices. It is to be noted that Examples 1-8 are the Examples 1-8 disclosed in Application Serial No. 10/606,825. The following table summarizes the amount of the chain extender present, the isocyanate index, and the DMTA results of each experiment.

	Chain Extender, pbw	Isocyanate Index	Application (1)		Current Samples	
			Tg, °C	Peak Tan Delta	Tg, °C	Peak Tan Delta
Ex. 1	0	90	15.6	0.95	-4.4	1.13
Ex. 2	0	95	20.3	0.91	0.2	1.05
Ex. 3	2.5	90	18.1	1.03	--	--
Ex. 4	2.5	95	22.7	0.97	--	--
Ex. 5	5	90	28.8	1.01	2.6	1.21
Ex. 6	5	95	33.9	0.93	7.6	1.05
Ex. 7	7.5	90	29.1	1.06	14.7	1.22
Ex. 8	7.5	95	31.1	0.99	15.7	1.15
Ex. 9	15	90	--	--	26.6	1.24
Ex. 10	15	95	--	--	32.4	1.11
Ex. 11	30	90	--	--	46.4	1.20
Ex. 12	30	95	--	--	50.8	1.07

Table 2

From Table 2, when the chain extender is present in smaller amounts, there is little impact on the glass transition temperature and the peak tan delta. However, when the amount of the chain extender increases, the glass transition temperature begins to increase and coincide with the use temperature of the foam. Examples 7-10 illustrate glass transition temperatures that coincide with the use temperature of the foam. When the amount of the chain extender exceeds 30 parts by weight, the foam becomes rigid and no longer exhibits viscoelastic properties. Examples 11 and 12 illustrate the glass transition temperature of 46.4 °C and 50.8 °C, whereupon foams having higher glass transition temperatures are no longer have viscoelastic properties. Comparing Examples 1 and 7, the glass transition temperature increased by 13.5 °C from the patent application (1) and 19.1°C in the current samples. Comparing Examples 2 and 8, the glass transition temperature increased by 10.8 °C and 15.5 °C, respectively.

A second set of experiments, similar to those of in Application Serial No. 10/607,555, were



conducted having a different isocyanate-reactive component than the first set of experiments. In addition to a different isocyanate-reactive component, the amount of the chain extender and isocyanate index were varied. The base formulation for the viscoelastic polyurethane foam was as follows:

<b>Component</b>	<b>Parts By Weight</b>
Pluracol <sup>®</sup> 593 (a functionality of 2.96, a weight-average molecular weight of 3606, hydroxyl number of 460, and 75% EO-25% PO heteric)	60
Pluracol <sup>®</sup> 1538 (a functionality of 2.8, a weight-average molecular weight of about 3000, hydroxyl number of 56, and 6% EO-94% PO heteric)	40
Catalyst 1 (Niax <sup>®</sup> A-1)	0.1
Catalyst 2 (DABCO <sup>®</sup> 33LV)	0.6
Stabilizer (Tegostab <sup>®</sup> B-8409)	0.4
Monol (Iconol <sup>®</sup> DA 4)	1.0
Water	1.43
Isocyanate No. 278	

Table 3

The isocyanate-reactive component included a blend of a flexible polyol (Pluracol<sup>®</sup> 1538) and a EO-rich polyol (Pluracol<sup>®</sup> 593) and the isocyanate component is Isocyanate No. 278, all of which are commercially available from BASF Corporation. In comparison to the first set, the second set of experiments has the EO-rich polyol present in lesser amounts and the flexible polyol is present in higher amounts. Additionally, the flexible polyol has a higher molecular weight than that of the first set of experiments. The chain extender utilized with the second set of experiments is Niax<sup>®</sup> DP1022.

The foams were prepared in a similar method as set forth above with regard to Examples 9-12. Further, the DMTA was measured in the same manner for these Examples and the results are

illustrated in the below table.

	Chain Extender	Isocyanate Index	Tg, °C	Peak Tan Delta
Ex. 13	0	83	-27	1.0
Ex. 14	2.5	83	-10	0.9
Ex. 15	5	83	-3	0.9
Ex. 16	7.5	83	5	1.0
Ex. 17	15	83	23	1.3
Ex. 18	30	83	44	1.6
Ex. 19	60	83	62	1.7

Table 4

From Table 4, even when a different isocyanate-reactive component is employed, the presence of the chain extender impacts the glass transition temperature and the peak tan delta. When the amount of chain extender is used in less than 7 parts by weight, the glass transition temperature does not coincide with the use temperature. However, when the amount of the chain extender increases, the glass transition temperature begins to increase and coincide with the use temperature of the foam. Example 17 illustrates the glass transition temperature that coincides with the use temperature of the foam. When the amount of the chain extender exceeds 30 parts by weight, the foam becomes rigid and loses the viscoelastic properties. Examples 18 and 19 illustrate the glass transition temperature of 44 °C and 62 °C, whereupon the foams become rigid and no longer exhibit viscoelastic properties.

A third set of data, taken from co-pending Application Serial No. 10/916,241, illustrates the subject invention when used with yet another isocyanate-reactive component.

Component	Parts By Weight
Pluracol <sup>®</sup> 593 (a functionality of 2.96, a weight-average molecular weight of 3606, hydroxyl number of 460, and 75% EO-25% PO heteric)	40
Pluracol <sup>®</sup> 2100 (a functionality of about 3, a weight-average molecular weight of about 6000, a hydroxyl number of about 25 mg KOH/g, and 5% EO-95% PO heteric)	60
Catalyst 1 (DABCO <sup>®</sup> BL-11)	0.15
Catalyst 2 (DABCO <sup>®</sup> 33LV)	0.4
Surfactant (NIAx <sup>®</sup> Silicone L-5614)	0.15
Water	1.5
Isocyanate No. 278	

Table 5

The isocyanate-reactive component included a blend of a flexible polyol (Pluracol<sup>®</sup> 2100) and a EO-rich polyol (Pluracol<sup>®</sup> 593) and the isocyanate component is Isocyanate No. 278, all of which are commercially available from BASF Corporation. In the third set of data, the flexible polyol is added as a major component and the EO-rich polyol is present in lesser amounts. The chain extender utilized with the third experiment is Niax<sup>®</sup> DP1022.

The foams are prepared similar to those described above for Examples 1-7 as described in the pending patent application (1) and the DMTA is measured in accordance with D4065. The results of the DMTA are illustrated in the following table.

	Chain Extender	Isocyanate Index	Tg, °C	Peak Tan Delta
Ex. 20	9	87	28.8	0.61

Table 6

From Table 6, even when a different isocyanate-reactive component is employed, the presence of the chain extender in the claimed amounts results in the glass transition temperature coinciding with the use temperature.

12. I am aware of, have read, and understand the disclosure of Hager et al. (United States Patent No. 6,391,935), cited by the Examiner, which is entitled “Viscoelastic Polyurethane Foams.”

13. I am also aware of, have read, and understand the disclosure of Lutter et al. (United States Patent No. 5,420,170), cited by the Examiner, which is entitled “Preparation of Flexible, Soft Polyurethane Foams Having Viscoelastic, Structure-Borne Soundproofing Properties, and Polyoxyalkylene-Polyol Mixtures which can be used for this purpose.”

14. I am also aware of, have read, and understand the disclosure of Bleys (United States Patent No. 5,968,993), cited by the Examiner, which is entitled “Microcellular Elastomeric Polyurethane Foams.”

15. As a result of my review of the Hager et al., Lutter et al., and Bleys and also as a result of my understanding from the perspective of one skilled in the art, it is clear that these references disclose, teach, or suggest a viscoelastic polyurethane foam having a glass transition temperature that is varied by modifying the amount the chain extender that is present or that there is suggestion or motivation to modify these references to arrive at the subject invention as claimed. Further, these foams of the cited references would not produce a viscoelastic polyurethane foam having a glass transition temperature that coincides with a use temperature. The modifications of

these references as suggested by the Examiner will not achieve my goal of adjusting the glass transition temperature without having to adjust or modify other major components of the formulations, i.e., isocyanate components and isocyanate-reactive components.

16. **Hager et al.**

Goals of Hager et al.

It is apparent that Hager et al. asserts that the viscoelastic polyurethane foam is produced using a unique isocyanate-reactive mixture that includes a specific monol. Further, Hager et al. states that it was surprisingly found that the monol-containing isocyanate reactive mixture *was the key* to formulating viscoelastic foams over a broad range of processing conditions and isocyanate indices.

Deficiencies of Hager et al.

Hager et al. does not disclose, teach, or suggest that the glass transition temperature, or temperature sensitivity, can be manipulated by adjusting the amount of the chain extender present in the formulation. Instead, Hager et al. focused on the presence of the monol to provide the viscoelastic foam without disclosing, teaching, or suggesting varying the glass transition temperature. In fact, Hager et al. does disclose using a chain extender; however, the chain extender is optional and is used only in minor proportions (see col. 4, lines 60-61).

Additionally, the examples disclosed in Hager et al. employ the chain extender in minor amounts. Example 16 utilizes the chain extender, 2-methyl-1,3-propanediol, in an amount of 2.0 parts by weight and Example 19 utilizes the chain extender, dipropylene glycol, in an amount of 2.0 parts by weight. Each example was formulated with an isocyanate index of 100. Since Hager et al.

is silent as to glass transition temperature for foams made in accordance with the disclosure, samples were made according to Examples 16 and 19 and the glass transition and peak tan delta were determined.

The following table sets forth the formulation used to prepare the foams. Two formulations for Examples 16 and 19 were prepared testing different monols in accordance with the disclosure of Hager et al.

Component	Parts By Weight			
	Ex. 16		Ex. 19	
Pluracol <sup>®</sup> 1135 (glycerine initiated, a functionality of about 3, a weight-average molecular weight of about 1500, a hydroxyl number of about 112)	40.00		29.00	
Arch Polyol G-30-168 (glycerine initiated, a hydroxyl number of about 168, All-PO)	--		29.00	
Monol A (n-BuOH+PO, OH=28, 18% EO cap, CsOH catalysis)	40.00	--	40.00	--
Monol B (n-BuOH+PO, OH=43, 10% EO cap, CsOH catalysis)	--	40.00	--	40.00
Niax DP-1022	2.00		--	
Diethylene glycol	--		2.00	
T-9 (Stannous octoate)	0.12		0.12	
Catalyst (DABCO <sup>®</sup> 33LV)	0.60		0.70	
L-620 (Goldschmidt Silicone Surfactant)	0.60		0.60	
FR (Flame Retardant)	3.00		3.00	
Water	2.00		2.00	
Isocyanate No. 278				

Table 7

Hager et al. does not disclose incorporating the isocyanate-reactive component as a blend of a flexible polyol and an EO-rich polyol. Further, Hager et al. does not disclose incorporating the chain extender in amounts used by the subject invention.

The foams were prepared in a similar manner to that described above and the DMTA was

also measured in accordance with D4065 as discussed above with regard to Example 9-12. The following table illustrates the results of the DMTA.

	<b>Hager et al.</b>			
	Ex. 16		Ex. 19	
Glass Transition Temperature, °C	-11	-14	-2	-3
Peak Tan Delta	0.5	0.5	0.5	0.5

Table 8

Upon inspection of these examples and in comparison to Examples 1-20 performed above, the subject invention provides that the glass transition temperature can be manipulated via the chain extender. Examples 1-4 of the subject invention have the same or lower amounts of the chain extender present and still achieve a glass transition temperature greater than those taught by Hager et al. Thus, Hager et al. merely manipulated the major components and the monol to provide the desired properties of the viscoelastic polyurethane foam without recognizing any impact on the glass transition temperature.

Accordingly, Hager et al. does not solve the problem of adjusting the glass transition temperature of the foam by adjusting the amount of the chain extender that is present in the formulation.

17. **Lutter et al.**

**Goals of Lutter et al.**

It is apparent that Lutter et al. asserts that the viscoelastic polyurethane foams have a relaxation behavior that act preferentially due to a matrix of the foam. Sound waves set the matrix in vibration such that the foam requires high damping and high modulus. Lutter et al. states that good soundproofing requires a loss factor of 0.3 or more over as broad a frequency range as

possible (see col. 2, lines 36-66). This goal is achieved by using a polyoxyalkylene-polyol mixture of *specially* structured polyoxypropylene-polyoxyethylene polyols as the high-molecular weight compound (see col. 4, lines 4-9).

#### Deficiencies of Lutter et al.

Lutter et al. does not disclose, teach, or suggest that the glass transition temperature, or temperature sensitivity, can be manipulated by adjusting the amount of the chain extender present in the formulation. Instead, Lutter et al. states that the chain extender, if desired, is *expediently* used in amount from 1 to 60, preferably from 1 to 10 parts by weight per 100 parts by weight of the *specially structured* polyoxypropylene-polyoxyethylene polyols (see col. 9, lines 15-20). Moreover, Lutter et al. states that it is the novel polyoxyalkylene polyol mixture comprising the block polyoxypropylene-polyoxyethylenepolyol mixture (ai) and the difunctional and/or trifunctional polyoxypropylene/polyoxyethylene-polyol (aii) that provides viscoelastic, structure-borne soundproofing properties in a temperature range of from -20 °C to +80 °C, which is different than the glass transition temperature of the subject invention. The flexible, soft foams and moldings produced by Lutter et al. are used in the domestic sector, for example for foam backings for carpets, providing sound absorption when walked on, as paneling elements and, in the automobile industry, as structure-borne soundproofing materials, for example for enclosing the engine compartment or for reducing internal noise in vehicles by means of top layers backed with these foams (see col. 13, lines 27-43).

Lutter et al. does not disclose using a chain extender to adjust the glass transition temperature of the viscoelastic polyurethane foams. Soundproofing articles are not subjected to the same constraints as articles that form a hardness gradient when contacted by a user. Articles that



are used by users have the unique problem of needing to conform sufficiently from heat of the user, while still remaining sufficiently hard to adequately support the user. If the glass transition temperature is not consistent with the use temperature of the foam, the foam may not adequately support the user when used. For example, the foam may be too hard to too soft depending if the glass transition temperature is too high or too low, respectively.

Additionally, the examples disclosed in Lutter et al. employ the chain extender in amounts less than claimed. Examples 5 to 8 disclose the chain extender present in an amount of 6 parts by weight and the properties are listed in the following table. A sample foam was made according to the disclosure of Lutter et al. The following table sets forth the formulation used to prepare the foams.

<b>Component</b>	<b>Parts By Weight</b>
Pluracol <sup>®</sup> 593 (a functionality of 2.96, a weight-average molecular weight of 3606, hydroxyl number of 460, and 75% EO-25% PO heteric)	72.80
Pluracol <sup>®</sup> 220 ( a functionality of 3, a weight-average molecular weight of 6000, hydroxyl number of 25, and 5% EO-95% PO heteric)	18.70
1,4-butanediol	6.00
Catalyst 1 (Niax <sup>®</sup> A-1)	0.20
Catalyst 2 (DABCO <sup>®</sup> 33LV)	0.50
Polycat 5	0.10
Stabilizer (Tegostab <sup>®</sup> B-8418)	1.00
Texcat ZR-170	
Water	2.60
Lupranate <sup>®</sup> M20S	

Table 9

The foams were prepared in a similar manner to that described above and the DMTA was measured in accordance with D4065 as discussed above with regard to Example 9-12. The following table illustrates the results of the DMTA.

	<b>Lutter et al.</b>
Glass Transition Temperature, °C	52
Peak Tan Delta	0.4

Table 10

Upon inspection of this example and in comparison to Examples 1-20 performed above, the subject invention provides that the glass transition temperature coincides with the use temperature of the foam when the chain extender is used at the claimed amounts. Examples 1-20 of the subject invention have higher amounts of the chain extender present and have a glass transition temperature that nearly coincides with the use temperature, whereas Lutter et al. had less chain extender present and a glass transition temperature that is above those of the subject invention. As discussed above, Lutter et al. was not adjusting the glass transition temperature by manipulating the amount of the chain extender and did not recognize any impact the amount of the chain extender may have on the glass transition temperature of the foam.

Accordingly, Lutter et al. does not solve the problem of adjusting the glass transition temperature of the foam by adjusting the amount of the chain extender that is present in the formulation.

#### 18. **Bleys**

It is apparent that Bleys discloses microcellular polyurethane elastomeric polyurethane foams having a density of less than 62.4 pounds per cubic foot and a Shore A hardness of at least 75 (see col. 3, lines 23-29). Those of ordinary skill in the art readily appreciate that microcellular elastomeric polyurethane foams do not exhibit as high of a tan delta peak as viscoelastic polyurethane foams because such elastomers do not exhibit viscoelastic characteristics. It is further

readily appreciated that viscoelastic polyurethane foams are considered flexible foams and not rigid foams. The subject invention is directed to viscoelastic polyurethane foams having a density of 2.5 to 25 pounds per cubic foot. Viscoelastic foams also have a Shore A hardness of less than 85, whereas Bleys requires a Shore A hardness of at least 85.

Accordingly, Bleys does not solve the problem of adjusting the glass transition temperature of the foam by adjusting the amount of the chain extender that is present in the formulation.

19. **Lack of Teaching or Suggestion to Adjust Temperature Sensitivity**

As one of high skill in the art, at the time of the subject invention, there was no teaching or suggestion that modifying the amount of the chain extender present in the viscoelastic polyurethane foam would vary the glass transition temperature and temperature sensitivity to accommodate specific use temperatures. The presence of the chain extenders in Hager et al., Lutter et al., and Bleys are attributable to general benefits that are well known when including chain extenders in minor amounts and are not connected with the advantages of the subject invention. As suggested by the Examiner, the chain extender in Hager et al. controls polymer build-up when present in minor amounts, without recognizing the dramatic impact on the glass transition temperature. This results because, prior to the subject invention, there was no recognition that the glass transition temperature could be so dramatically affected.

Further, since there was no teaching or suggestion of such a result in these prior art references, one of ordinary skill in the art would not have been motivated to modify the references as suggested by the Examiner.

20. **Conclusion**

None of the cited references disclose, teach, or suggest modifying the amount of the chain extender as claimed to vary the glass transition temperature and temperature sensitivity thereof. Further, modifying these references will not achieve my goal of adjusting the glass transition temperature without having to adjust or modify other major components of the formulations, i.e., isocyanate components and isocyanate-reactive components. In other words, my goal to provide a solution to requiring designer isocyanate-reactive components for achieving viscoelastic polyurethane foams with varying glass transition temperatures that coincide with use temperatures has not been satisfied through these references.

21. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information are believed to be true, and further that these statements were made with the knowledge that willful and false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or patent issued thereon.

**Respectfully submitted,**

Dated

5/30/06

Raymond Neff

Raymond Neff